

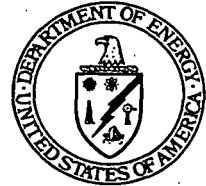


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Mr. James A. Saric, Remedial Project Manager  
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Chicago, IL 60604-3590

DOE-0087-00

Mr. Tom Schneider, Project Manager  
Ohio Environmental Protection Agency  
401 E. 5th Street  
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Dear Mr. Saric and Mr. Schneider:

### TRANSMITTAL OF PROPOSED CHANGES RESULTING FROM THE 1999 ANNUAL REVIEW OF THE INTEGRATED ENVIRONMENTAL MONITORING PLAN

Reference: Letter, J. Reising to J. Saric and M. Murphy, "Application for Approval to Use Environmental Measurements to Demonstrate Compliance with the National Emission Standards for Hazardous Air Pollutants Subpart H," dated May 23, 1997

This letter documents the completion of the annual review of the Integrated Environmental Monitoring Plan (IEMP), Revision 1, and identifies the necessary program modifications. The requirement for the IEMP annual review is identified in Section 8.0 of the plan. It states that the annual review cycle provides the mechanism for identifying and initiating any program modifications necessary to align the IEMP with near-term remediation activities and that any resultant modifications to the IEMP will be communicated to the U.S. Environmental Protection Agency (U.S. EPA) and Ohio Environmental Protection Agency (OEPA).

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Modifications to the monitoring programs, which have been identified through the review process, are primarily designed to:

- Address any remediation activities expected to begin during 2000 that have not already been identified.
- Incorporate any commitments made through the IEMP quarterly status reports and the 1998 Integrated Site Environmental Report or associated comment response documents.
- Incorporate any new or revised regulatory requirements or agreements.

To facilitate and document the review process, an enclosure has been provided which includes a table summarizing the proposed changes to the IEMP, Revision 1, and the reasons for the changes. Also enclosed are four Attachments that provide detailed information on some of the changes discussed in the letter and/or Summary Table. The changes identified in the enclosure are to be implemented in January 2000, unless otherwise noted in the enclosure (specifically under the Driver/Technical Information column of the Summary Table). The proposed changes identified in this enclosure will be formally incorporated in the next revision of the IEMP.

The paragraphs below provide a summary of some general changes that were identified through the review process. A more detailed description of specific changes and associated justifications are provided in the enclosures (Summary Table and Attachments). It should be noted that no modifications were necessary for Sections 4.0, Surface Water and Treated Effluent Monitoring Program; 5.0, Sediment Monitoring Program; and 8.0, Program Summary and Reporting, and Appendices A, B, and D of the IEMP, Revision 1.

#### **Sections 1.0 and 2.0 (Introduction and Summary of FEMP Remedial Strategy)**

Sections 1.0 and 2.0 should be revised to reflect that the Soil Characterization and Excavation Project and the On-Site Disposal Facility Project have been combined into the Soil and Disposal Facility Project. This reorganization does not affect the scope or nature of remediation activities for these projects.

#### **Section 3.0 (Groundwater Monitoring)**

In Section 3.0, several changes should be made regarding the wells sampled and/or measured for the South Plume Module, South Field Extraction Module, Waste Storage Area Module, and Routine Water-Level Monitoring programs (Groundwater Elevation program). Well changes are primarily due to either construction and demolition activities or are intended to better define the edge of the South Plume. In addition, the U.S. Department of Energy (DOE) proposes to remove Section 3.5.1.7, which defines the routine flow direction measurements using the colloidal borescope. Future use of the

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colloidal borescope will be defined on a project-specific basis. The DOE proposal regarding this issue is provided in Attachment 3. Finally, there are some minor proposed changes to the reporting requirements associated with groundwater. These proposed changes are identified in the Summary Table (under Section 3.7.2 information) and are also discussed in the Reporting Requirements section later in this letter.

#### **Section 4.0 (Surface Water Monitoring)**

The IEMP quarterly status reports and annual integrated site environmental reports include an estimate of the pounds of uranium discharged to the environment in uncontrolled runoff from the Fernald Environmental Management Project (FEMP). To date, this estimate has been calculated using a loading term of 6.25 pounds of uranium discharged to Paddys Run for every inch of rainfall. This value was developed during the remedial investigation and is based on site conditions and analytical data collected during the late 1980s and early 1990s. Recognizing that significant changes have occurred in the FEMP landscape over the past three years as a result of active remediation, it is appropriate to re-evaluate this loading term in light of current conditions.

Therefore, the estimate of uranium discharged to the environment through uncontrolled runoff per inch of rainfall has been re-evaluated and documented in this review. The calculations to support the new estimate, based on more current drainage basin patterns and more recent analytical data collected at the discharge points into Paddys Run, are provided in Attachment 1. As expected, the revised estimate for the amount of uranium released through uncontrolled runoff is significantly less (2.53 pounds per inch of rainfall) as a result of the removal of contaminant sources and the additional measures that have been taken to control contaminated runoff over the last several years. Beginning in January 2000, the loading term of 2.53 pounds of total uranium per inch of rainfall will be used in calculations estimating the pounds of total uranium entering the environment through uncontrolled runoff.

As identified above, the information pertaining to this topic is provided in Attachment 1. This information is not included in the summary table because it is not formally presented in the IEMP.

It should also be noted that the National Pollutant Discharge Elimination System (NPDES) is currently being revised and changes to the monitoring program are anticipated to be implemented during 2000. These changes will be identified in separate transmittals.

#### **Section 6.0 and Appendix C (Air Monitoring)**

Minor revisions should be made to the Air Monitoring Section (Section 6 and Appendix C), specifically within the Radiological Air Particulate Monitoring program, the Dose Assessment, and the Radon Monitoring program.

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Under the Radiological Air Particulate Monitoring program, Table 6-2 requires modification. Specifically, the detection limits for the radio isotopes analyzed for in the quarterly composite samples are incorrect. The detection limits should be aligned with the Highest Allowable Minimum Detectable Concentrations (HAMDC) presented in Appendix C, Table C-2. The HAMDC presented in Table C-2 are consistent with those approved by the U.S. EPA in the FEMP's application for an alternate air monitoring approach for demonstrating National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H compliance (Reference).

The need for some minor clarification was identified in the Dose Assessment (Appendix C) specifically in Section C.3.3.1 (Air Monitoring for NESHAP Subpart H Compliance). The modification to this section clarifies how non-detects are treated in the dose calculations for demonstrating NESHAP compliance. This clarification will not impact the FEMP's NESHAP compliance demonstration.

Finally, DOE is proposing to add four monitoring locations to the Radon Monitoring program in the area of the K-65 Silos, in preparation for the Silos 1 and 2 Accelerated Waste Retrieval Project, and subsequent treatment operations for the Silos 1, 2, and 3 materials (locations for these monitors are described in the Summary Table and Attachment 4).

#### Reporting Requirements

In addition to presenting the changes resulting from the annual review, this letter serves to identify that the IEMP quarterly status reports will be available on the Internet beginning with the report due in December 1999. The DOE, U.S. EPA, and OEPA discussed this in September 1999 via the weekly phone conference call. The report placed on the Internet in December will also be available in hard copy format as agreed upon with the agencies.

It is important to note that reporting commitments identified in the IEMP (specifically 3.7.2 [Groundwater], 4.6.2 [Surface Water], 6.6.2 [Air], 8.3.3 [Overall], and Appendix D [Natural Resources]) will continue to be met in the Internet version with the exception of the following items (pertaining specifically to Groundwater):

- The groundwater total uranium plume map will be updated on a biannual basis rather than quarterly.

DOE recommends publishing total uranium plume maps biannually rather than quarterly because the total uranium plume does not change enough between quarters to warrant a new map each quarter. Concentration data will still be collected quarterly as identified in the IEMP; however, the total uranium plume maps would only be published in the first and third quarters of each year. Publishing biannual maps using this schedule will insure that a plume map is

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produced for both seasonally wet times of the year (second and third quarters) and seasonally dry times of the year (fourth and first quarters).

- Routine quarterly groundwater flow direction measurements from the borescope will be discontinued (refer to enclosure [Attachment 3] for technical justification).
- Information pertaining to the On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan will be reported separately from the Groundwater Remedy reporting in both the IEMP quarterly status reports, and annual integrated site environmental reports in order to facilitate the review of this information.

The DOE requests the U.S. EPA and OEPA concurrence with these exceptions and the other proposed changes detailed in this transmittal by December 1999. This will allow DOE to:

- Incorporate the proposed reporting changes into the Integrated Environmental Monitoring Status Report for Third Quarter 1999 due in December.
- Implement the proposed changes to IEMP monitoring programs at the beginning of the annual reporting cycle (January 2000).

Should you have any questions regarding this submittal, please contact Kathleen Nickel at (513) 648-3166.

FEMP:Nickel

Enclosures

Sincerely,



Johnny W. Reising  
Fernald Remedial Action  
Project Manager

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cc w/enclosures:

N. Hallein, EM-42/CLOV  
G. Jablonowski, USEPA-V, SRF-5J  
T. Schneider, OEPA - Dayton (total of three copies of enclosures)  
F. Barker, Tetra Tech  
F. Bell, ATSDR  
M. Murphy, USEPA-V, AE-17J  
T. Schneider, OEPA-Dayton (total of 3 copies of enclosures)  
M. Schupe, HSI GeoTrans  
R. Vandergrift, ODOH  
AR Coordinator, FDF/78

cc w/o enclosures:

K. Nickel, OH/FEMP  
J. Reising, OH/FEMP  
A. Tanner, OH/FEMP  
D. Carr, FDF/52-2  
T. Hagen, FDF/65-2  
J. Harmon, FDF/90  
R. Heck, FDF/2  
M. Hickey, FDF/64  
S. Hinnefeld, FDF/90  
U. Kumthekar, FDF/64  
T. Walsh, FDF/65-2  
ECDC, FDF/52-7

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## SUMMARY TABLE OF PROPOSED TECHNICAL CHANGES TO THE INTEGRATED ENVIRONMENTAL MONITORING PLAN, REV. 1

Section/Page Number	Description of Proposed Modification	Driver/Technical Information
Section 1.0, pg. 1-3	<p>The second bullet in the list of remediation activities excluded from the scope of the Integrated Environmental Monitoring Plan (IEMP) should be revised as follows:</p> <p>"The soil remediation pre-certification and certification sampling program which will be conducted as part of the work scope of the Soil and Disposal Facility Project."</p>	The Soil Characterization and Excavation Project has been combined with the On-Site Disposal Facility Project to form the Soil and Disposal Facility Project.
Figure 2-1, pg. 2-2	The Fernald Environmental Management Project (FEMP) Accelerated Remediation Case Master Schedule should be revised.	Beginning and ending dates of some remediation activities have changed (refer to Attachment 2).
Section 2.1, pg. 2-3	<p>The second bullet in the project organization list should be revised as follows:</p> <ul style="list-style-type: none"> <li>"Soil and Disposal Facility Project: This project is responsible for the completion of remedial actions to address contaminated soil at the FEMP and miscellaneous waste units including the South Field, flyash piles, lime sludge ponds, and the solid waste landfill; also excavation/removal of building foundations, roadways, underground utilities and piping systems, and sitewide restoration activities and management of perched water encountered during remediation. This project is also responsible for the design, installation, and closure of the on-site disposal facility and monitoring leachate within the on-site disposal facility and perched groundwater in the till beneath the on-site disposal facility. Oversight of waste acceptance criteria compliance is provided by Waste Acceptance Operations."</li> </ul>	The Soil Characterization and Excavation Project has been combined with the On-Site Disposal Facility Project to form the Soil and Disposal Facility Project.
Table 2-1, Operable Unit 1 Project Organization/Responsibilities, pg. 2-4	The Soil Characterization and Excavation Project should be changed to the Soil and Disposal Facility Project.	The Soil Characterization and Excavation Project has been combined with the On-Site Disposal Facility Project to form the Soil and Disposal Facility Project.

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**SUMMARY TABLE**  
(Continued)

Section/Page Number	Description of Proposed Modification	Driver/Technical Information
Table 2-1, Operable Units 2, 3, 4, and 5 Project Organization/Responsibilities, pg. 2-4	The responsibilities for the Soil Characterization and Excavation Project and the On-Site Disposal Facility Project should be combined under the heading "Soil and Disposal Facility Project."	The Soil Characterization and Excavation Project has been combined with the On-Site Disposal Facility Project to form the Soil and Disposal Facility Project.
Section 2.1, pg. 2-8	The On-site Disposal Facility Design Project bullet should be deleted.	The scope has been incorporated into the Soil and Disposal Facility Project bullet.
Section 3.3.3, pg. 3-11	The second sentence of the section should be revised as follows:  "The interpretation of groundwater data in relation to the performance of the on-site disposal facility is the responsibility of the Aquifer Restoration and Wastewater Project."	Responsibility for groundwater data pertaining to the on-site disposal facility is no longer shared by the On-Site Disposal Facility Project and the Aquifer Restoration and Wastewater Project.
Section 3.5.1.1, South Plume Module Activity 2, pg. 3-34	The second to last sentence in the last paragraph in this section beginning with "A proposal for new monitoring wells . . ." should be revised as follows:  "New monitoring wells have been installed and developed under an independent work plan."	Monitoring Wells 6880 and 6881 have been installed to better define the edge of the South Plume. Sampling will begin in the fourth quarter of 1999.
Section 3.5.1.1, South Plume Module Activity 1, pg. 3-30	The first sentence in the Activity 1 subsection should be revised to state:  "An operational assessment of the South Plume Module will be made by documenting the concentration of total uranium that is being removed from the six extraction wells and determining the monthly average uranium removal index of the extraction wells in pounds of total uranium removed per million gallons pumped."	The concentration of uranium being removed from the extraction wells does not indicate the level of efficiency of the wells. Therefore, the pounds of uranium removed per million gallons of water pumped will be called an "index."

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# SUMMARY TABLE (Continued)

Section/Page Number	Description of Proposed Modification	Driver/Technical Information
Table 3-3, South Plume Module Activity 2 column, pg. 3-31, Figure 3-5, 3-33	Monitoring Wells 2060, 2434, 2544, 2880, 2881, 3880, 3881, and 21194 should be removed from the South Plume Module. Monitoring Wells 6880 and 6881 should be added.	The screens in the existing wells are not positioned at the correct depth to properly monitor the uranium plume. The new wells are screened at the correct depth. Sampling of Monitoring Wells 2880, 2881, 3880, and 3881 will be discontinued and sampling of Monitoring Wells 6880 and 6881 will begin in the fourth quarter of 1999. Monitoring Well 2060 will continue to be sampled quarterly under the private well sample activity. Monitoring Well 3069 is located near Monitoring Well 2434 and is positioned at the correct depth to monitor the plume. No replacement for Monitoring Well 2544 is planned at this time. Monitoring of the South Plume recovery wells just south of Monitoring Well 2544 will suffice for now.
Section 3.5.1.1, South Plume Module Activity 2, Pg. 3-34	The second to last sentence in the last paragraph in this section beginning with "A proposal for new monitoring wells . . ." should be revised as follows:  "New monitoring wells have been installed and are being developed under an independent work plan."	Monitoring Wells 6880 and 6881 have been installed to better define the edge of the South Plume. Sampling will begin in the fourth quarter of 1999.
Table 3-3, South Plume Module Activity 3 column, pg. 3-31, Figure 3-6, pg. 3-35	Monitoring Wells 2880, 2881, 3880, and 3881 should be removed from the South Plume Module. Monitoring Wells 6880 and 6881 should be added.	The screens in the existing wells are not positioned at the correct depth to properly monitor the uranium plume. The new wells are screened at the correct depth. Sampling of Monitoring Wells 2880, 2881, 3880, and 3881 will be discontinued and sampling of Monitoring Wells 6880 and 6881 will begin in the fourth quarter of 1999.
List of South Field Extraction Monitoring Wells at the bottom of pg. 3-39, Figure 3-8, pg. 3-40	Monitoring Wells 62408 and 62433 should be added to the South Field Extraction Module.	These wells were added to increase monitoring on the eastern edge of the South Field Module. These wells will be sampled beginning in the fourth quarter of 1999.
List of Waste Storage Area Monitoring Wells on pg. 3-43, Figure 3-9, pg. 3-44	Monitoring Wells 2033, 2034, and 3034 should be removed from the Waste Storage Area Module.	These wells are scheduled to be plugged and abandoned prior to January 2000 to make way for a radon treatment building.

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**SUMMARY TABLE**  
(Continued)

Section/Page Number	Description of Proposed Modification	Driver/Technical Information
Section 3.5.1.6, pgs. 3-48 through 3-50	Type 3 wells should no longer be measured as part of the Routine Water-Level Monitoring program.	As identified in the Integrated Environmental Monitoring Status Report for Second Quarter 1999, it was proposed to discontinue the measurement of water levels in Type 3 monitoring wells beginning in the third quarter of 1999 because of the absence of vertical hydraulic gradients at the FEMP. The general absence of vertical gradients between Type 2 and Type 3 monitoring wells was discussed in Appendix A.3, pages A.3-1 and A.3-2 of the 1998 Integrated Site Environmental Report. However, the text in Appendix A.3 did identify an apparent vertical gradient between Monitoring Wells 2398 and 3398 which, upon further investigation, has been determined to be non-existent. The 1998 differences between Monitoring Wells 2398 and 3398 were due to a re-surveying error (i.e., the monitoring well reference elevation was incorrectly updated). Therefore it is concluded that there are no vertical hydraulic gradients between Type 2 and Type 3 wells at the FEMP.
List of Groundwater Elevation Monitoring Wells, pg. 3-49, Figure 3-11, pg. 3-50	Monitoring Wells 2880, 2881, 3880, and 3881 should be removed from the list of routine water-level monitoring wells. Monitoring Wells 6880, 6881, 62408, and 62433 should be added.	Monitoring wells 6880 and 6881 were installed to replace Monitoring Wells 2880, 2881, 3880, and 3881. Monitoring Wells 62408 and 62433 are new additions to the South Field Extraction Module. These changes will take effect in the fourth quarter of 1999.
Section 3.5.1.7, pg. 3-51	Section 3.5.1.7, "Flow Direction Measurements" (Borescope) should be deleted.	See Attachment 3 for justification.
Section 3.5.2.3, pg. 3-58, Figure 3-15, pg. 3-59	This section, including Figure 3-15 and the List of Constituents which will be Sampled Annually in the KC-2 Warehouse Monitoring Well (Well 67), should be removed.	KC-2 Warehouse monitoring will not be conducted in 2000 since the KC-2 Warehouse well is scheduled to be plugged and abandoned early in 2000. As part of the plugging and abandonment process, suspect debris associated with the KC-2 Warehouse well will be removed and characterized.

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**SUMMARY TABLE**  
(Continued)

Section/Page Number	Description of Proposed Modification	Driver/Technical Information
Section 3.7.2, pg. 3-86	<p>The last sentence of the first paragraph (under this section) should be updated as follows:</p> <p>"In addition, groundwater data that support the On-site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan (DOE 1997b) will also be provided; however, it will be provided in a separate section from the groundwater remedy section in both the IEMP quarterly status reports and annual integrated site environmental reports."</p>	The on-site disposal facility monitoring program is not related to the groundwater remedy performance monitoring; therefore, it warrants its own section.
Section 3.7.2, Aquifer Conditions, pg. 3-87	The first bullet under "Aquifer Conditions" should not change; however, in the past, both water elevation maps and borescope maps were provided to meet reporting requirements. Borescope maps will no longer be reported. This will affect future IEMP quarterly status reports and annual integrated site environmental reports without changing the text of the IEMP.	See Attachment 3 for justification.
Section 3.7.2, Aquifer Conditions, pg. 3-87	<p>The second bullet under "Aquifer Conditions" should be revised as follows:</p> <p>"A description of the plan view geometry of the uranium plume will be provided biannually."</p>	The plume map changes very little from quarter to quarter. Maps from first and third quarter data will provide a representative view of the plume from both the wet and dry seasons.
Table 6-2, pg. 6-18	It is proposed that the detection limits for the radio isotopes analyzed for in the quarterly composite samples be revised to align with the highest allowable minimum detectable concentrations (HAMDCs) presented in Appendix C, Table C-2.	The HAMDCs presented in Table C-2 are consistent with those approved by the U.S. Environmental Protection Agency (EPA) in the FEMP's application for an alternate air monitoring approach for demonstrating National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H compliance.

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**SUMMARY TABLE**  
(Continued)

Section/Page Number	Description of Proposed Modification	Driver/Technical Information
Figure 6-3, pg. 6-19	<p>It is proposed that four monitoring locations be added to the map (refer to Attachment 4). The tentative locations and designations for the monitors are:</p> <ul style="list-style-type: none"> <li>• North of Silo 2 at the K-65 exclusion fence, designated as KNO</li> <li>• South of Silo 1 at the new south camera tower, designated as KSO</li> <li>• To the east of Silo 4, midway between Silo 4 and the Bio-Surge Lagoon, and in the prevailing wind direction from Silo 3, designated as LP2</li> <li>• Southwest of the High Nitrate Storage Tank, near pole #543 at Trailer #117, designated as T117.</li> </ul> <p>The availability of electric power, as well as, construction activity in the Silos Project area may delay the installation or necessitate the relocation of the monitors from the tentative locations. The monitors are expected to be in operation by January 2000.</p>	The locations will provide additional monitoring of radon levels in the vicinity of the silos in preparation for the Silos 1 and 2 Accelerated Waste Retrieval Project and subsequent treatment operations for the Silos 1, 2, and 3 material.
Figure 6-4, Direct Radiation ... IEMP Air Monitoring Locations, pg. 6-22	TLD locations 6 and 16 should be switched on the map to reflect the correct monitoring locations.	The map is erroneous.
Appendix C, Criterion IV, pg. C-15	<p>Under "<u>Managing Analytical Results</u>", sentence 3 of the first paragraph should be revised to state:</p> <p>"Air sample results which are reported . . ."</p>	This text should be revised to clarify that all air sample results reported below the minimum detectable concentration will be considered non-detects, regardless of location.
Appendix C, Criterion VI, pg. C-15	The first sentence of the first paragraph, "The initial (1997) submittal of the IEMP to the EPA served as the application," should be deleted.	This statement is incorrect.

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**ATTACHMENT 1**

**EVALUATION OF URANIUM LOADING VIA  
UNCONTROLLED SURFACE WATER RUNOFF**

## EVALUATION OF URANIUM LOADING VIA UNCONTROLLED SURFACE WATER RUNOFF

The Integrated Environmental Monitoring Plan (IEMP) quarterly status reports and integrated site environmental reports include an estimate of the pounds of uranium discharged to the environment in uncontrolled runoff from the Fernald Environmental Management Project (FEMP). To date, this estimate has been calculated using a loading term of 6.25 pounds of total uranium discharged to Paddys Run for every inch of rainfall. This value was developed during the remedial investigation and is based on site conditions and analytical data collected during the late 1980s and early 1990s. Recognizing that significant changes have occurred in the FEMP landscape over the past three years as a result of active remediation, it is appropriate to re-evaluate this loading term. This attachment presents the results of the evaluation process based on current drainage basin patterns and recent analytical data collected at the primary discharge points for uncontrolled runoff into Paddys Run.

Included in this attachment is the total uranium data set used in the evaluation, the location of the pertinent drainage basins and associated changes impacting uncontrolled runoff, and the statistical analysis and calculations used to develop the updated loading term. This information is organized under the following sections:

- Data preparation and statistical analysis
- Equations and calculations
- Conclusions.

The evaluation presented in this attachment serves as the technical justification for revising/updating the loading term used for estimating the pounds of uranium discharged to the environment through uncontrolled runoff. This evaluation process will be repeated in the future as remediation progresses and site conditions affecting the quantity and/or quality of uncontrolled runoff are documented.

## ATTACHMENT 1 (Continued)

### A.1 DATA PREPARATION AND STATISTICAL ANALYSIS

In order to provide an assessment of impacts to surface water due to uncontrolled runoff, it was necessary to identify the uncontrolled drainage basin areas associated with the FEMP. The FEMP has several drainage basins; however, only four are considered to be uncontrolled drainage basin areas which discharge to Paddys Run. Each of these four drainage area basins has an associated monitoring location (STRM 4003, STRM 4004, STRM 4005, and STRM 4006). Figure A-1 identifies the drainage basin areas associated with the FEMP and the monitoring locations associated with the uncontrolled drainage basins. The text below defines the data set that was used in order to re-evaluate the value of interest and the statistical analysis the data underwent prior to performing calculations.

#### A.1.1 Data Preparation

Post-remedial investigation total uranium concentrations from surface water locations STRM 4003, STRM 4004, STRM 4005, and STRM 4006 were reviewed. Table A-1 presents the total uranium results for these locations from January 1997 to March 1999 from these locations. From the table, it should be noted that the number of samples taken from each of the four locations varies, because programmatic requirements (e.g., sample frequencies) and because of sample locations being dry at times. The data in the table were then screened using the standard criteria used for IEMP data:

- 1) Half the non-detectable concentrations were used (results with validation qualifier of U or UJ).
- 2) A concentration of zero was used if the validated result was less than zero (e.g., radiological constituents can have negative concentrations when laboratory backgrounds are subtracted from results).
- 3) The maximum result of either the field duplicate or normal sample was used if more than one sample existed for a given location on the same day.
- 4) Rejected data were not used (results with validation qualifier of Z or R).

The application of Criteria 1, 2, and 4 did not result in alteration of the data set. However, the data set was slightly altered when Criterion 3 was applied.

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ATTACHMENT 1  
(Continued)

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**A.1.2 Statistical Analysis**

The total uranium concentration in surface water for each of the four sample locations was estimated by using the 95 percent upper confidence limit of the mean (UCL) of data collected at the respective sample locations. Using the 95 percent UCL is standard practice and provides conservative results.

The initial steps in generating a meaningful UCL value include determining the nature of the underlying distribution and identifying and removing outliers. The procedures used in the statistical evaluation are outlined below.

**Outlier Detection and Data Distribution Assumption**

The detection of outliers in a data set often depends on the assumed nature of the underlying distribution of the data. In addition, goodness-of-fit tests for data sets to various distributions can be greatly influenced by the presence of outliers. The two concepts are interrelated and, as such, an iterative process must be followed. The method employed to determine outliers and the nature of the underlying distribution was as follows:

- A goodness-of-fit test (Shapiro-Wilk procedure) was performed on the full untransformed data set to determine the probability level of the data being from a normal distribution.
- The Shapiro-Wilk procedure was performed on the full log-transformed data set to determine the probability level of the data being from a lognormal distribution.
- Under the assumption that the data were normally distributed, Rosner's outlier procedure was performed on the untransformed data, and any detected outliers (at the 5 percent significance level) were removed. A Shapiro-Wilk procedure was performed on the remaining untransformed data set to determine the probability level of the data being from a normal distribution.
- Under the assumption that the data were lognormally distributed, Rosner's outlier procedure was performed on the log-transformed data and any detected outliers (at the 5 percent significance level) were removed. A Shapiro-Wilk procedure was performed on the remaining log-transformed data set to determine the probability level of the data being from a lognormal distribution.

**ATTACHMENT 1**  
**(Continued)**

The probability levels from the four procedures are compared and the procedure with the greatest probability level is determined to be the best fit to the data set. If any outliers are identified by the selected procedure, then they are removed from the data set before any further calculations are performed on the data set.

For small sample data sets, Rosner's outlier procedure could not be used. In these cases, Dixon's procedure was used. Additionally, small sample sizes also make it difficult to determine the underlying distribution of the data set. In these cases, the normal distribution was assumed for the purposes of outlier determination and UCL calculation.

**Statistical Results: Outliers and Distribution Assumptions**

**(Sample Locations STRM 4003, STRM 4004, and STRM 4006)**

It was assumed that the data were normally distributed for the purposes of outlier identification and for further statistical evaluation. There were too few sample results to identify potential outliers using Rosner's procedure; therefore, potential outliers were identified using Dixon's procedure, which is specifically designed for small data sets that are normally distributed. For all three sample locations, Dixon's procedure failed to identify any outliers at the 5 percent significance level. Therefore, the full data sets for these three sample locations were used for subsequent statistical evaluation.

**(Sample Location STRM 4005)**

Sample location STRM 4005 had 31 sample results, which is an acceptable sample size for both distribution testing using the Shapiro-Wilk procedure and outlier detection using Rosner's procedure. Based on the procedure outlined above, the best fit scenario was that the data were normally distributed with one outlier detected. The potential outlier identified was the 170 micrograms per liter ( $\mu\text{g/L}$ ) result sampled on June 2, 1997. This result is nearly double that of the second highest result of 88.5  $\mu\text{g/L}$  sampled on September 23, 1998. The Rosner test statistic for the potential outlier was calculated to be 5.887. This is a significance level of less than 0.005, which represents less than a 0.5 percent chance that this data point is from the same population as the remaining 30 samples. For subsequent statistical calculations, this data point was considered to be an outlier and removed from the data set.

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## A.2 EQUATIONS AND CALCULATIONS

### A.2.1 Equations

Equation 1 was used to determine the pounds of uranium per inch of rainfall estimated to be present in uncontrolled runoff from the FEMP. This equation was used in the past to determine the previous value of 6.25 pounds of uranium per inch of rainfall. The equation was used for each drainage basin area (identified on Figure A-1) and then the pounds of uranium per inch of rainfall (associated with each drainage basin) were summed in order to achieve a current representative number for the FEMP.

Equation 1:  $P = V * UC * 0.008337$

where:

P = Pounds of uranium for each inch of rainfall (per drainage basin) (lbs/inch of rainfall)

V = Volume of runoff per inch of rainfall (per drainage basin) (Mgal/inch of rainfall)

UC = 95 percent UCL for total uranium concentrations (per drainage basin) ( $\mu\text{g/L}$ )

0.008337 = Conversion factor used to convert to pounds per inch of rainfall  
((L\*lbs)/(Mgal\* $\mu\text{g}$ ))

The 95 percent UCL for total uranium concentrations was determined through the statistical evaluation identified in Section A.2. The specific concentrations for the drainage basins are provided in Table A-2.

The volume of runoff per inch of rainfall (V) in the above equation must be calculated for each drainage basin and is done so by the following equation:

Equation 2:  $V = C * T * 0.027$

where:

V = Volume of runoff per inch of rainfall (per drainage basin) (Mgal/inch of rainfall)

C = Runoff coefficient (unitless)

**ATTACHMENT 1**  
**(Continued)**

T = Total drainage basin area (acres)

0.027 = Conversion factor used to convert to Mgal per inch of rainfall  
(Mgal/(acre\*inch))

The runoff coefficient identified above must also be calculated for each drainage basin and is done so by the below equation. This standard equation is from the EPA Office of Water Enforcement and Permits Guidance Manual/EPA Stormwater Guidance Manual (EPA 1991).

Equation 3:  $C = (0.5 * TP/T) + (0.9 * TI/T)$

where:

C = Runoff coefficient (unitless)

TP = Total pervious drainage basin area (acres)

T = Total drainage basin area (acres)

TI = Total impervious drainage basin area (acres)

The acres associated with the drainage basins (total, pervious, and impervious) are presented in Table A-2. Total drainage basin area acreage does not include any acreage where surface water is controlled (refer to Figure A-1). Therefore, because the amount of controlled areas has increased (e.g., areas in the vicinity of the on-site disposal cell and the southern waste units) since the remedial investigation, the total acreage associated with the drainage basins has been reduced. Pervious drainage basin area refers to those areas with natural surfaces (e.g., grass and soils) and impervious drainage basin area refers to those areas with manmade surfaces (e.g., paved roads, gravel roads, and structures with roofs).

#### A.2.2 Calculations

The equations provided in Section A.3.1 along with Table A-2 were used to perform the calculations. Below are some sample equations and Table A-3 provides the results from all the equations.

Equation 3:  $C = (0.5 * TP/T) + (0.9 * TI/T)$

for STRM 4003:

$$C = (0.5 * (483.3/517.7)) + (0.9 * (34.4/517.7))$$

$$C = 0.5266$$

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ATTACHMENT 1  
(Continued)

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Equation 2:  $V = C * T * 0.027$

for STRM 4003:

$$V = 0.5266 * 517.7 * 0.027$$

$$V = 7.361 \text{ Mgal/inch}$$

Equation 1:  $P = V * UC * 0.008337$

for STRM 4003:

$$P = 7.361 * 13.5 * 0.008337$$

$$P = 0.828 \text{ lbs/inch}$$

Summing the pounds of uranium for each inch of rainfall (P) for each drainage basin area identified in Table A-3 would yield the value of 2.53 pounds of uranium for each inch of rainfall.

### A.3 CONCLUSIONS

The loading value of 2.53 pounds of uranium per inch of rainfall will be used in future calculations when estimating the pounds of uranium entering the environment through uncontrolled runoff. As expected, the revised estimate for the amount of uranium released through uncontrolled runoff is significantly less (2.53 versus 6.25 pounds per inch of rainfall) as a result of the removal of contaminant sources and the additional measures that have been taken to control contaminated runoff over the last several years. In an effort to maintain an accurate loading term, this evaluation process will be repeated in the future as remediation progresses and site conditions affecting the quantity and/or quality of uncontrolled runoff are observed.

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**ATTACHMENT 1**  
**(Continued)**

**TABLE A-1**

**TOTAL URANIUM RESULTS FOR SURFACE WATER**  
**LOCATIONS 4003, 4004, 4005, AND 4006**

Surface Water Monitoring Locations	Constituent	Date Sampled <sup>a</sup>	Validated Result <sup>a</sup>	Validation Qualifier	Units	Type <sup>b</sup>
STRM 4003	Uranium, Total	6/2/97	3	NV	µg/L	N
STRM 4003	Uranium, Total	6/16/97	2.6	NV	µg/L	N
STRM 4003	Uranium, Total	6/16/97	5.74	NV	µg/L	N
STRM 4003	Uranium, Total	12/4/97	17.8	NV	µg/L	N
STRM 4003	Uranium, Total	6/10/98	4.2	NV	µg/L	N
STRM 4003	Uranium, Total	12/22/98	8.6	NV	µg/L	N
STRM 4004	Uranium, Total	6/2/97	80.5	NV	µg/L	N
STRM 4004	Uranium, Total	8/20/97	22.8	NV	µg/L	D
STRM 4004	Uranium, Total	8/20/97	26.5	NV	µg/L	N
STRM 4004	Uranium, Total	6/11/98	4.1	NV	µg/L	N
STRM 4004	Uranium, Total	12/22/98	7.2	NV	µg/L	N
STRM 4005	Uranium, Total	1/1/97	75	NV	µg/L	N
STRM 4005	Uranium, Total	1/8/97	67	NV	µg/L	N
STRM 4005	Uranium, Total	1/22/97	53	NV	µg/L	N
STRM 4005	Uranium, Total	2/5/97	64	NV	µg/L	N
STRM 4005	Uranium, Total	2/12/97	81	NV	µg/L	N
STRM 4005	Uranium, Total	2/19/97	81	NV	µg/L	N
STRM 4005	Uranium, Total	2/26/97	69	NV	µg/L	N
STRM 4005	Uranium, Total	4/9/97	59	NV	µg/L	N
STRM 4005	Uranium, Total	4/16/97	66	NV	µg/L	N
STRM 4005	Uranium, Total	6/2/97	170 <sup>c</sup>	NV	µg/L	N
STRM 4005	Uranium, Total	7/22/97	52	NV	µg/L	N
STRM 4005	Uranium, Total	7/22/97	52	NV	µg/L	N
STRM 4005	Uranium, Total	8/22/97	86	NV	µg/L	D
STRM 4005	Uranium, Total	8/22/97	88	NV	µg/L	N
STRM 4005	Uranium, Total	9/11/97	65	NV	µg/L	N
STRM 4005	Uranium, Total	10/27/97	52	NV	µg/L	N
STRM 4005	Uranium, Total	11/21/97	58	NV	µg/L	N
STRM 4005	Uranium, Total	12/4/97	70.8	NV	µg/L	N
STRM 4005	Uranium, Total	12/12/97	82.396	J	µg/L	N
STRM 4005	Uranium, Total	1/9/98	83	NV	µg/L	N
STRM 4005	Uranium, Total	2/12/98	77.3	NV	µg/L	N
STRM 4005	Uranium, Total	3/17/98	21	NV	µg/L	N
STRM 4005	Uranium, Total	4/1/98	61.4	NV	µg/L	N
STRM 4005	Uranium, Total	6/10/98	32.8	NV	µg/L	N
STRM 4005	Uranium, Total	6/17/98	77	NV	µg/L	N
STRM 4005	Uranium, Total	7/23/98	54.6	NV	µg/L	N
STRM 4005	Uranium, Total	8/26/98	19.9	-	µg/L	N
STRM 4005	Uranium, Total	9/23/98	88.5	NV	µg/L	N
STRM 4005	Uranium, Total	10/21/98	47.005	J	µg/L	N
STRM 4005	Uranium, Total	11/13/98	49.4	NV	µg/L	N

**ATTACHMENT 1**  
**(Continued)**

**TABLE A-1**  
**(Continued)**

Surface Water Monitoring Locations	Constituent	Date Sampled <sup>a</sup>	Validated Result <sup>a</sup>	Validation Qualifier	Units	Type <sup>b</sup>
STRM 4005	Uranium, Total	12/15/98	35.7	NV	µg/L	N
STRM 4005	Uranium, Total	12/18/98	34.7	NV	µg/L	N
STRM 4005	Uranium, Total	3/17/99	47.4	NV	µg/L	N
STRM 4006	Uranium, Total	5/24/97	15.7	NV	µg/L	N
STRM 4006	Uranium, Total	5/24/97	15.7	NV	µg/L	N
STRM 4006	Uranium, Total	6/2/97	47.3	NV	µg/L	N
STRM 4006	Uranium, Total	12/4/97	1	NV	µg/L	N
STRM 4006	Uranium, Total	6/10/98	2.1	NV	µg/L	N
STRM 4006	Uranium, Total	12/17/98	52.5	NV	µg/L	N
STRM 4006	Uranium, Total	3/16/99	27	NV	µg/L	N

<sup>a</sup>If more than one sample is collected for a given location on the same day, then the sample with the maximum concentration is used for statistical analysis.

<sup>b</sup>If more than one sample per day is identified as N (normal), then composite and grab samples were collected. The highest concentration for the day was used for statistical analysis.

<sup>c</sup>Identified as an outlier in statistical analysis.

**ATTACHMENT 1**  
**(Continued)**

**TABLE A-2**

**TOTAL URANIUM AND DRAINAGE BASIN ACREAGE**  
**(TOTAL, IMPERVIOUS AND PERVIOUS) DATA USED TO PERFORM POUNDS OF**  
**URANIUM PER INCH OF RAINFALL CALCULATIONS**

Associated Surface Water Locations	95 Percent UCL for Total Uranium Concentrations (UC) (µg/L)	Total Drainage Basin Area (T) (acres)	Total Impervious Drainage Basin Area (TI) (acres)	Total Pervious Drainage Basin Area (TP) (acres)
STRM 4003	13.5	517.7	34.4	483.3
STRM 4004	71.19	17.0	0.7	16.3
STRM 4005	66.30	66.0	6.4	59.6
STRM 4006	42.4	210.5	6.9	203.6

ATTACHMENT 1  
(Continued)

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TABLE A-3

CALCULATED VARIABLES ASSOCIATED WITH  
EACH DRAINAGE BASIN SURFACE WATER LOCATION

Associated Surface Water Locations	Runoff Coefficient (C) (unitless)	Volume of Runoff per Inch of Rainfall (V) (Mgal/in)	Pounds of Uranium for Each Inch of Rainfall (P) (lbs/in)
STRM 4003	0.5266	7.361	0.828
STRM 4004	0.52	0.24	0.14
STRM 4005	0.539	0.960	0.531
STRM 4006	0.514	2.92	1.03

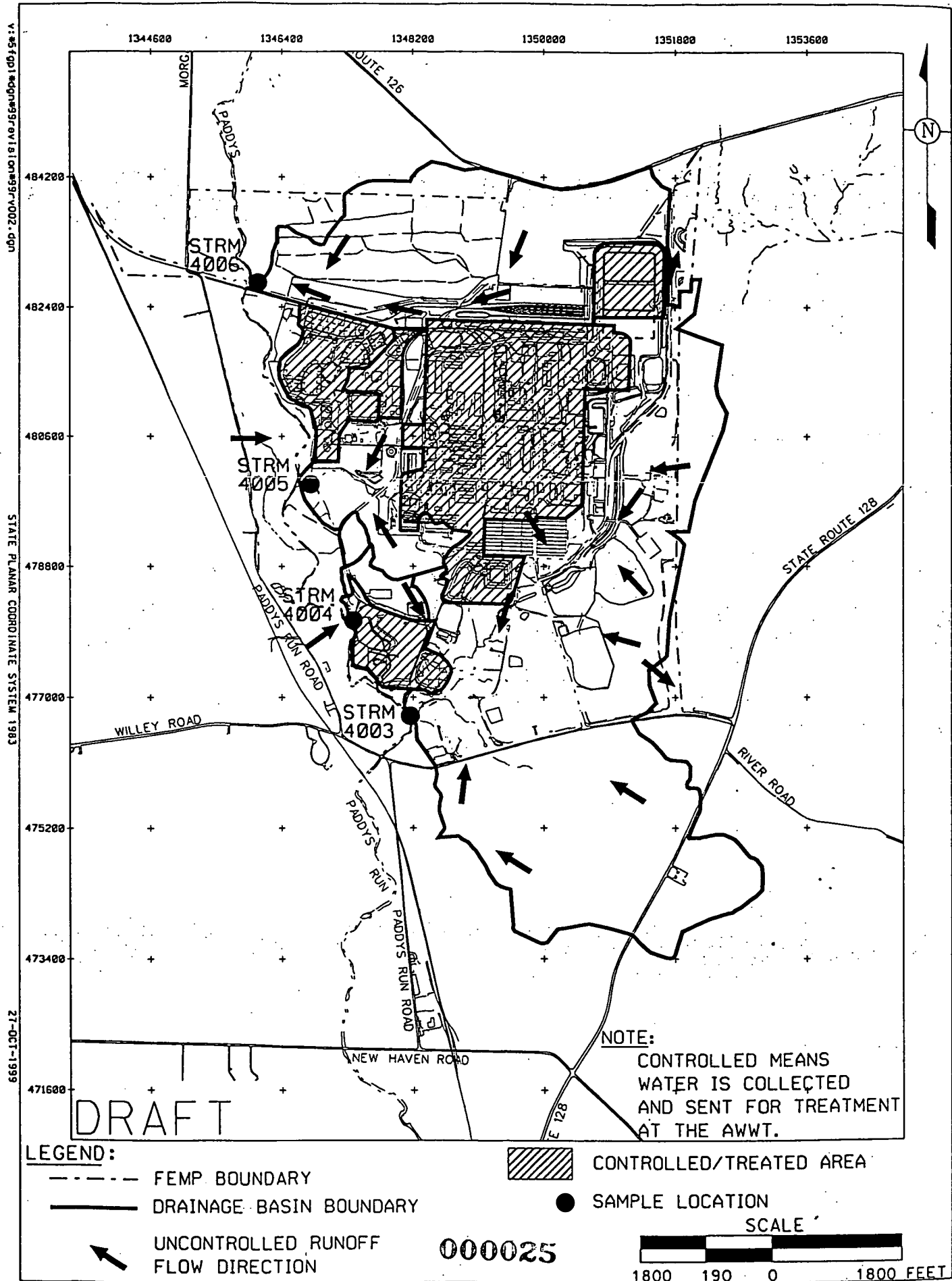


FIGURE A-1. DRAINAGE BASIN AREAS AND ASSOCIATED SURFACE WATER MONITORING LOCATIONS

ATTACHMENT 1  
(Continued)

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REFERENCES

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**ATTACHMENT 2**

**FEMP ACCELERATED REMEDIATION CASE MASTER SCHEDULE**

**000027**

# FEMP ACCELERATED REMEDIATION CASE MASTER SCHEDULE<sup>a</sup>

Areas	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Operable Unit 1 (waste pits)	Remediation Facility Construction									
	Waste Excavation, Treatment and Shipment Off-Site by Rail, Facility D&D									
Operable Unit 2 (misc. waste units)	Excavation and Interim Restoration									
	Nuclear Material Disposition <sup>b</sup>									
Operable Unit 3 (former production area)	Facility D&D and Restoration									
	Uranium Waste Disposition									
	VITPP Waste Disposition									
Operable Unit 4 <sup>c</sup> (silos)	Infrastructure Construction									
	Design Silo 3 Remediation									
	Design Accelerated Waste Retrieval (AWR)									
	AWR Construction and Operations									
	Silo 3 Remediation Construction & Operations									
	Design Silos 1 & 2 Full Scale Remediation									
	Silos 1 and 2 Full-Scale Construction									
Operable Unit 5 (soil and water) <sup>d</sup>	Soil Excavation <sup>e</sup>									
	Advanced Waste Water Treatment, Groundwater Recovery Well/Re-Injection Systems Operation									
On-Site Disposal Facility	Construction/Waste Placement/Capping									
	Silos 1 & 2 Full-Scale Remediation Operations									

<sup>a</sup>Based on site Master Schedule, September 1998 Status. Starting and completion dates reflect projections as of October 1999.

<sup>b</sup>Nuclear materials disposition included only product materials at the time the Operable Unit 3 Record of Decision was signed. Some of these nuclear materials have been reclassified as uranium waste, and disposition has been scheduled separately from the product materials.

<sup>c</sup>Operable Unit 4 Record of Decision Amendment, scheduled to be submitted to EPA in 2000, may affect technical approach and schedule.

<sup>d</sup>Activities projected through Area 6 interim restoration.

<sup>e</sup>Includes certification and reseedling. This schedule does not include excavation of Area 7 or the corridors.

ATTACHMENT 2

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**ATTACHMENT 3**

**FLOW DIRECTION MEASUREMENTS (BORESCOPE) REASSESSMENT**

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**FLOW DIRECTION MEASUREMENTS (BORESCOPE) REASSESSMENT**

The U.S. Department of Energy (DOE) has reassessed the role of the borescope and its value to the overall evaluation of the Fernald Environmental Management Project's (FEMP's) groundwater remedy. As a result of the reassessment, DOE proposes to redirect the focus of the borescope from a routine groundwater remedy performance monitoring component of the Integrated Environmental Monitoring Plan (IEMP) to an investigation-specific application. Under this proposal, routine borescope monitoring under the IEMP will be discontinued. Instead, the borescope will continue to be utilized, as needed, to address specific data needs identified by the Aquifer Restoration and Wastewater Project.

The borescope proposal is based on the following two issues.

- Data Interpretation Issue: Flow directions measured with a borescope should agree with flow directions interpreted from the slope of the water table, but often they do not. Flow directions recorded with the borescope reflect flow on a very local scale. A camera monitors the movement of very small particles within a single plane of focus in front of the camera lens. Flow directions recorded by the camera represent a snapshot of a very small segment of a very long and tortuous flow path that the particle is progressing along. All of the repeated twists and turns that a particle takes, as it migrates through the aquifer, eventually average out into a general flow direction, as indicated by the slope of the water table. With this in mind, flow directions of discrete and localized segments of particle tracks measured with the borescope often provide little added value to regional flow direction interpretations that are made using the slope of the water table.
- Timing Issue: Borecope measurements are often collected at a different time than water level measurements are collected. This temporal difference creates interpretation problems when the two data sets are compared.

The FEMP monitors water levels quarterly at approximately 180 monitoring wells. These data provide the basis for determining groundwater flow directions, and evaluating capture for the aquifer remedy. DOE believes these data provide the level of detail necessary for conducting a routine assessment of the aquifer's response to the extraction and re-injection activities associated with the aquifer remedy.

Use of the borescope in the future will be reserved for application-specific studies. For example, it has been used at the FEMP quite effectively in the past to document flow direction changes due to changes

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**ATTACHMENT 3**  
**(Continued)**

in the pumping rates of nearby pumping wells. Under this application, the actual flow direction is not the issue, but rather the change in direction. This use of the borescope tool eliminates the data interpretation and timing issues noted above. Routine borescope monitoring outlined in Section 3.5.1.7 of the IEMP will be discontinued immediately upon receipt of U.S. Environmental Protection Agency and Ohio Environmental Protection Agency approval.

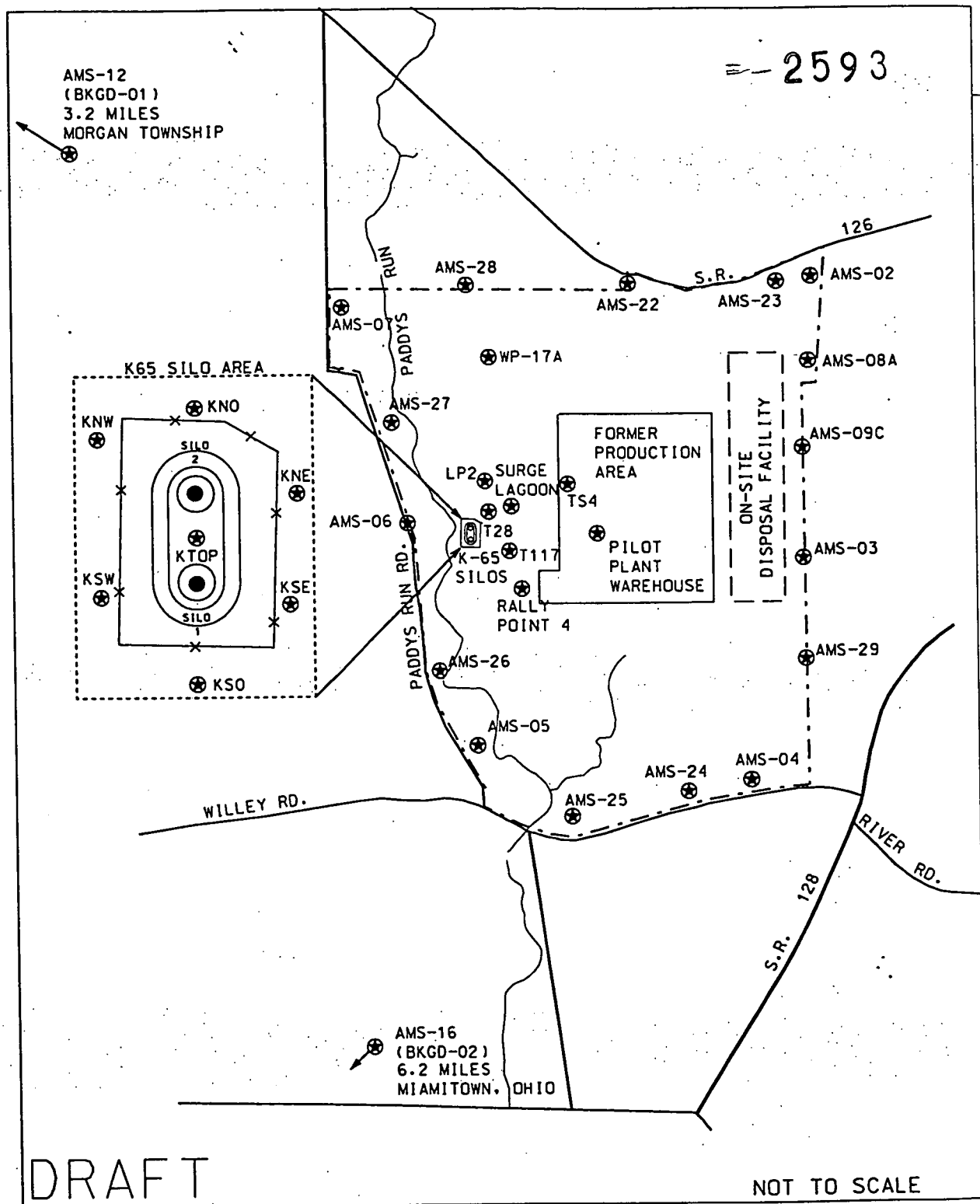
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**ATTACHMENT 4**

**RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATIONS**

**000032**



**LEGEND:**

----- FEMP BOUNDARY

⊕ ENVIRONMENTAL RADON MONITORING -  
CONTINUOUS ALPHA  
SCINTILLATION LOCATION



DISTANCE FROM CENTER OF  
FORMER PRODUCTION AREA  
TO LOCATION OFF MAP

● SILO HEAD SPACE RADON  
MONITORING - CONTINUOUS ALPHA  
SCINTILLATION LOCATION

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FIGURE 6-3. RADON MONITORING - CONTINUOUS  
ALPHA SCINTILLATION LOCATIONS